

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL SEARCH REPORT (PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference ES/11229.219	<b>FOR FURTHER ACTION</b> see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/CA2004/001509	International filing date ( <i>day/month/year</i> ) 16 August 2004 (16-08-2004)	(Earliest) Priority date ( <i>day/month/year</i> ) 15 August 2003 (15-08-2003)
Applicant UNIVERSITE DE LAVAL		
This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.		
This international search report consists of a total of <u>6</u> sheets.  <div style="margin-left: 40px;"> <input checked="" type="checkbox"/> It is also accompanied by a copy of each prior art document cited in this report.         </div>		
<b>1. Basis of the report</b>  <div style="margin-left: 20px;">           a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.   <div style="margin-left: 40px;"> <input type="checkbox"/> the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).           </div> </div> <div style="margin-left: 20px;">           b. <input type="checkbox"/> With regard to any nucleotide and/or amino acid sequence disclosed in the international application, see Box No. I.         </div>		
<div style="margin-left: 20px;">           2. <input checked="" type="checkbox"/> Certain claims were found unsearchable (See Box II).         </div>		
<div style="margin-left: 20px;">           3. <input type="checkbox"/> Unity of invention is lacking (See Box III).         </div>		
<div style="margin-left: 20px;">           4. With regard to the title.   <div style="margin-left: 40px;"> <input checked="" type="checkbox"/> the text is approved as submitted by the applicant.   <input type="checkbox"/> the text has been established by this Authority to read as follows :           </div> </div>		
<div style="margin-left: 20px;">           5. With regard to the abstract.   <div style="margin-left: 40px;"> <input type="checkbox"/> the text is approved as submitted by the applicant.   <input checked="" type="checkbox"/> the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.           </div> </div>		
<div style="margin-left: 20px;">           6. With regard to the drawings,   <div style="margin-left: 20px;">             a. The figure of the drawings to be published with the abstract is Figure   <div style="margin-left: 40px;"> <input type="checkbox"/> as suggested by the applicant.   <input type="checkbox"/> As selected by this authority, because the applicant failed to suggest a figure.   <input type="checkbox"/> As selected by this Authority, because this figure better characterizes the invention.             </div> </div> <div style="margin-left: 20px;">             b. <input checked="" type="checkbox"/> None of the figures is to be published with the abstract.           </div> </div>		

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/CA2004/001509

## Box No. II Observations where certain claims were found unsearchable (Continuation of Item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons :

1. ☐ Claims Nos. :  
because they relate to subject matter not required to be searched by this Authority; namely:
  
2. ☒ Claims Nos.: 44 (in part) and 100 (in part)  
  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically :  
  
due to the lack of support and the broadness of claims 44 and 100, the search of claims 44 and 100 was limited to polymerization products of 2-functionalized and 2,7-difunctionalized carbazole derivatives and to the examples given in figures 1 to 4.
  
3. ☐ Claims Nos. :  
because they are dependant claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box III Observation where unity of invention is lacking (Continuation of Item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows :

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos. :
  
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos. :

Remark on Protest ☐ The additional search fees were accompanied by the applicant's protest.  
☐ No protest accompanied the payment of additional search fees.

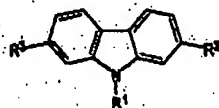
## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/CA2004/001509

## Box IV

## Text of the abstract (Continuation of item 5 of first sheet)

The present invention relates to 2-functionalized and 2,7-difunctionalized carbazoles and to 2,7-carbazolenevinylene oligomers and polymers. More specifically, the present invention relates to a compound of Formula I:



Formula I

wherein R<sup>1</sup> is selected from the group consisting of H, alkyl, and aryl; and wherein R<sup>2</sup> and R<sup>3</sup> are independently selected from the group consisting of H, alkyl, formyl, hydroxymethyl, trityloxymethyl, cyanomethyl, chloromethyl, methylphosphonate, methyltriphenylphosphonium and vinyl.

The oligomers and polymers are used in field-effect transistors, light-emitting devices such as light-emitting diodes, and solar cells.

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/CA2004/001509**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC<sup>6</sup> C07D 209/86, C08F 26/12

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC<sup>6</sup> C07D 209/86, C08F 26/12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base, and, where practicable, search terms used)

Canadian Patent Database, Delphion, STN

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 03/022816 A1 (EQUISTAR CHEMICALS, LP) 20 March 2003, page 2, lines 11-28.	1
X	US 5902884 (CLARIANT GMBH) 11 May 1999, column 2, lines 16-52 and examples 1 to 8.	1
X	CA 2196046 (SANKYO COMPANY) 08 February 1996, pages 5 to 9.	1
X	CA 1026348 (HOFFMAN-LA ROCHE LIMITED) 14 February 1978, page 2.	1
X	Limburg, W.W.; Yanus, J.F.; Williams, D.J.; Goedde, A.O.; Pearson, J.M. Anionic Polymerization of N-Ethyl-2-Vinylcarbazole and N-Ethyl-3-Vinylcarbazole. <i>Journal of Polymer Science, Polymer Chemistry Edition</i> , 1975, 13(5), 1133-9, whole document.	1, 2, 28, 44 and 100
X	Ambrose, J.F.; Nelson, R.F. Anodic Oxidation Pathways of Carbazoles. <i>J. Electrochem. Soc.</i> , 1968, 115, 1159-1164, whole document.	1
X	Registry Number 86-74-8 CAPLUS (9H-Carbazole)	1
X	Registry Number 1484-12-4 CAPLUS (9-Methyl-Carbazole)	1
X	Registry Number 86-28-2 CAPLUS (9-Ethyl-Carbazole)	1
X	Registry Number 1484-08-8 CAPLUS (9-Butyl-Carbazole)	1
X	Registry Number 1150-62-5 CAPLUS (9-Phenyl-Carbazole)	1

Further documents are listed in the continuation of Box C. ☒ XPatent family members are listed in annex. ☒ X

* Special categories of cited documents :	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international-type search  
10 Novembre 2004 (10.11.2004)Date of mailing of the international-type search report  
24 December 2004 (24-12-2004)Name and mailing address of the ISA/  
Commissioner of Patents  
Canadian Patent Office - PCT  
Ottawa/Gatineau K1A 0C9  
Facsimile No. 1-819-953-9358Authorized officer  
Edith Lacasse (819) 934-2325

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/CA2004/001509

C (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Registry number 56166-62-2 CAPLUS (9-ethyl-Carbazole-2-carboxaldehyde)	1, 2 and 28
X	Registry number 31110-89-1 CAPLUS (9-methyl-Carbazole-2,7-dicarboxaldehyde)	1 to 4
Y	CA 2360826 (UNIVERSITÉ LAVAL) 30 April 2002, page 2, lines 15-24.	1 to 139
Y	Liu, B.; Yu, W.-L.; Pei, J.; Liu, S.-Y.; Lai, Y.-H.; Huang, W. Design and Synthesis of Bipyridyl-Containing Conjugated Polymers: Effects of Polymer Rigidity on Metal Ion Sensing. <i>Macromolecules</i> , 2001, 34(23), 7932-7940, whole document.	1 to 139
Y	Goldoni, F.; Janssen, A.J.; Meijer, E.W. Synthesis and Characterization of New Copolymers of Thiophene and Vinylene: Poly(thienylenevinylene)s and Poly(terthienylenevinylene)s with Thioether Side Chains. <i>J. Polym. Sci. Part A</i> , 1999, 37, 4629-4639, whole document.	1 to 139
E	WO 2004/070772 A2 (COVION ORGANIC SEMICONDUCTORS GMBH) 19 August 2004, whole document.	1, 44, 45 and 100

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.  
**PCT/CA2004/001509**

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
WO03022816	20-03-2003	US6455704 B1 WO03022816 A1	24-09-2002 20-03-2003
US5902884	11-05-1999	DE19705466 A1 DE59802385D D1 EP0858995 A1 JP10279558 A US5902884 A	20-08-1998 24-01-2002 19-08-1998 20-10-1998 11-05-1999
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CA2360826	30-04-2002	CA2324757 A1 CA2360826 A1 US2002103332 A1	30-04-2002 30-04-2002 01-08-2002
WO 2004/070772 A2	19-08-2004	DE10304819 A1	19-08-2004